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Description

The present invention relates to nonwoven elastomeric webs and to elastomeric adhesive and cohesive materials which are useful as wound dressing or bandaging materials.

Background Information

Dressings and tapes applied to the skin should preferably exhibit a degree of stretchiness so that they do not unduly restrict movement of the underlying skin. This is particularly important in skin areas such as fingers, elbows and knees which are subjected to continuous stretching and relaxation during normal activities. If a tape does not exhibit elastic properties similar to or greater than skin, the tape will exert a force against the skin causing discomfort and in some cases, actual damage to the skin.

Cohesive, self-adhesive compression and support bandages applied to limbs of the body are required to be elastic to provide variable tensions dependent on application and compensate for edemic conditions. After being wrapped on a limb some elasticity should remain in the bandage to allow for subsequent edema in the limb and the bandage should have sufficient elastic recovery to return to substantially the extensibility at application after the edema subsides.

U.S. Patent No. 3,575,782 (Hansen) discloses an elastic shirred web product which consists of partially extended spaced aligned elastic yarns sealed between two thin porous gathered non-woven fibrous webs, or between a web and a non-porous film, by means of a soft flexible polymeric coherent binder.

U.S. Patent No. 4,366,814 (Riedel) discloses an elastic bandage material for medical tapes and dressing which has at least 50 percent by weight of an extensible porous fabric capable of elongation of at least 30 percent in one direction without tearing and at least 15 percent by weight of an elastomer uniformly impregnated in the fabric and substantially contained on or within the fibers of the fabric without filling the spaces between fibers. The fabric may be of a wide range of synthetic or natural fibers, used singly or in blends. The preferred elastomers include block copolymers, polyurethanes, acrylics, acrylic-olefinic copolymers, and other natural and synthetic rubbers.

U.S. Patent No. 4,414,970 (Berry) discloses a moisture vapor transmitting elastic bandage which has an inner layer of fabric and an outer layer of fabric bonded to a central layer which is an elastomeric film. The film can be continuous, macroporous or microporous, but is preferably continuous to provide a bacterial barrier. Suitable films which may be obtained in continuous form and which transmit moisture vapor can be made from polyurethane, for example, a thermoplastic polyurethane.

U.S. Patent No. 4,565,736 (Stein et al.) discloses a surgical compress which is made of an absorptive layer and a wound covering layer, the covering layer spun or otherwise made of nonwoven hydrophobic, hydrolysis-resistant, aliphatic polyurethane fibers, the covering layer preferably being autogenously bonded to the absorption layer by direct formation of tacky cover layer fibers on the absorption layer.

U.S. Patent No. 4,715,857 (Juhasz et al.) disclose wound dressings which comprise, in order, a first layer of a permeable material, a layer of a semi-permeable, adhesive material, a charcoal cloth or felt, and a second layer of a permeable material, in which the three layers a substantially co-extensive and surround the charcoal cloth or felt, whereby the first layer of permeable material is bound to the cloth or felt and, around the cloth or felt, to the second layer of permeable material. The layers of permeable material are in the form of a fabric or film and may be of different or, preferably, the same material, examples of suitable materials being natural or synthetic rubber, nylon, polyester, polyurethane and rayon acetate, and other suitable synthetic polymers. The semi-permeable adhesive materials are preferably double-sided transfer tapes.

U.S. Patent No. 4,653,492 (Parsons) discloses an elastic bandage having a resilient elastic layer and a relatively non-resilient layer. The elastic layer has sufficient resiliency so as to apply a compressive force to a body extremity when wrapped around the body extremity and the relatively non-resilient layer which has either less resiliency than the elastic layer or relatively little resiliency or no resiliency limits the stretching of the layer of elastic material so that an inexperienced person can apply the elastic bandage without fear of applying it too tightly or too loosely.

U.S. Patent No. 4,699,133 (Schafer et al.) discloses a cohesive, self-adhesive, rigid or elastic bandage for fixing, compression and support dressings and permanent elastic compression and support dressings for medical purposes. The bandage comprises a web of warp and weft threads or warp threads in the form of a woven fabric having a porous structure and an amount of ultra fine particles of an adhesive, such as a rubber adhesive distributed over and bonded to both the exposed surfaces of the warp and weft threads to provide adhesive particles bonded to the threads on both sides of the fabric.

British Patent Specification 1,575,830 (Johnson & Johnson) discloses a flexible and conformable disposable absorbent dressing which comprises a layer of absorbent material, and a thin, flexible, elastic and easily stretchable thermoplastic backing film retained in superimposed relationship with the absorbent layer, the backing film possessing an elastic recovery from 50 percent stretch of at least 75 percent, a rubber modulus of not above 2000 pounds per square inch and a Gurley stiffness at a thickness of 1 mil of not above one. The film is preferably formed from A-B-A block copolymers which consist to A end blocks derived from styrene and B blocks derived from conjugated dienes.

U.S. Patent No. 4,692,371 (M.T. Morman et al.) discloses elastomeric nonwoven webs of elastomeric melt blown fibers formed by inter alia melt blowing a polystyrenic poly(ethylenebutylene) thermoplastic block copolymer at elevated temperatures of at least about 290 °C. The disclosed elastomeric webs are stated to be suitable for use in, for example, making composite materials in which an elastic layer of material is bonded to a gatherable web. There is however an essential structural difference between the webs of the reference and those of the present invention in that in the webs of the present invention the small diameter fibers are randomly arrayed and bonded at points of contact.

Ogawa, in an article entitled "Development of Spunbonded Based on Thermoplastic Polyurethane," Nonwovens World, May-June, 1986. pp 79-81, describes a spunbonded nonwoven polyurethane elastic fabric developed by Kanebo Ltd. The fabric is made using a melt blown process which is different from a conventional melt blown process to produce fabric which is similar to that of spunbonded fabrics. The diameter of its filaments is not so fine as that of the usual melt blown fabrics, i.e., 0.5-2 mm, but apparently is closer to that of the spunbonded fabrics, i.e., 20-50 mm. The elasticity, dust catching capability, low linting, high friction coefficient, air permeability and welding characteristics of the urethane fabrics are discussed in the article.

Summary of the Invention

The present invention provides a nonwoven elastomeric web comprising elastomeric belt blown small diameter fibres having a diameter of less than 50 µm microns, the small diameter fibers being randomly arrayed and bonded at points of contact such that the machine direction tensile strength of the web is at least 30 g/2.5 cm width/g/m^2 basis weight the tensile strength of the web in the direction of web formation, i.e. the machine direction, is no greater than 2.5 times the tensile strength of the web in a direction perpendicular to the direction of web formation, i.e. the cross direction and the web recovers at least 85% in the machine direction after being stretched 50%.

The invention further provides an adhesive dressing comprising (1) a nonwoven elastomeric web having a first face and a second face comprising elastomeric melt-blown small diameter fibers having a diameter of less than 50 µm (microns), the small diameter fibers being randomly arrayed and bonded at points of contact such that the machine direction tensile strength of the web is at least 30 g/2.5 cm width/g/m^2 basis weight the tensile strength of the web in the direction of web formation is no greater than 2.5 times the tensile strength of the web in a direction perpendicular to the direction of web formation and the web recovers at least 85% in the machine direction after being stretched 50%, (2) a pressure-sensitive adhesive on the first face of the web, and (3) a low adhesion backsize coating on the second face of the web.

The present invention still further provides an elastomeric cohesive wrap comprising (1) a nonwoven elastomeric web having a first face and a second face comprising elastomeric melt blown small diameter fibers having a diameter of less than 50 µm (microns), the small diameter fibers being randomly arrayed and bonded at points of contact such that the machine direction tensile strength of the web is at least 30 g/2.5 cm width/g/m^2 basis weight the tensile strength of the web in the direction of web formation is no greater than 2.5 times the tensile strength of the web in a direction perpendicular to the direction of web formation and the web recovers at least 85% in the machine direction after being stretched 50% and (2) a self-adhesive coating adhered to at least one face of the web such that one portion of the web can adhere to another portion of the web.

The elastomeric adhesive materials of the present invention have multi-directional elastic properties, i.e., substantially comparable properties in both the machine and cross-machine directions, the tensile strength of the web in the direction of web formation being no greater than 2.5 times the tensile strength of the web in a direction perpendicular to the direction of web formation. Conventional wraps achieve multi-directional stretch properties only by using more expensive woven elastic fabrics which must have their edges securely anchored to prevent fiber slippage and subsequent loss of tensioning.

Both the adhesive and cohesive elastic materials find utility as an elastic bandage for fixing, compression or support dressings for medical purposes. The unique ability of the bandage to stretch and recover in both directions allows for more uniform compression, greater patient comfort and less potential for unsafe

use.

Detailed Description of the Invention

The nonwoven elastomeric webs of the present invention are based on melt blown webs of thermoplastic elastomeric small diameter fibers. Elastomeric thermoplastic materials from which the microfiber webs can be prepared include, for example, elastomeric polyurethanes, elastomeric polyesters, elastomeric polyamides and elastomeric A-B-A' block copolymers wherein A and A' are styrenic moieties and B is an elastomeric midblock.

Elastic properties of the nonwoven webs are controlled by the size of the fiber making up the web and the basis weight of the web. The elastomeric small diameter fibers preferably have diameters of from 1 µm (micron) to 50 µm (microns), more preferably from 5 µm (microns) to 30 µm (microns). When the diameter of the small diameter fibers is less than 1 µm (micron), the web may lack sufficient tensile strength. When the diameter of the small diameter fibers is greater than 50 µm (microns), the contact surface area for adhesive anchorage or cohesive material contact decreases. Specific applications and the tension or pressure required for those applications determines the most preferred microfiber diameter for a given application. Generally speaking, applications requiring low tension use webs having smaller diameter fibers while applications requiring higher tensions utilize webs having larger diameter fibers.

The basis weight of the nonwoven elastomeric web is also a major factor in controlling the elastic properties of the web. Higher basis weight webs are typically used for applications requiring higher tensions while lower basis weight webs are utilized for applications requiring low tensions. Web basis weights are preferably in the range of from 15 to 150 grams/m^2, more preferably in the range of from 20 to 70 gm/m^2. As was the case with the fiber diameter, the specific application will determine the optimum web basis weight.

The nonwoven elastomeric web of the invention has a machine direction tensile strength of at least 30 g/2.5 cm width/g/m^2 basis weight, preferably at least 40 g/2.5 cm width/g/m^2 basis weight. When the tensile strength is less than 15 g/2.5 cm width/g/m^2 basis weight, the web may tear when stretched.

The nonwoven elastomeric web of the invention preferably has an elongation at break of at least 250%, more preferably at least about 300%. When the elongation at break is less than 100%, the web does not exhibit acceptable elastic characteristics.

The nonwoven elastomeric web of the invention preferably has a machine direction force at 50% elongation of at least 5 g/2.5 cm width/g/m^2 basis weight, more preferably at least 7 g/2.5 cm width/g/m^2 basis weight. When the force at 50% elongation is less than 3 g/2.5 cm width/g/m^2 basis weight, the web does not exhibit desirable compression characteristics.

The nonwoven elastomeric web of the invention preferably has a recovery force at 50% elongation of at least 1.2 g/2.5 cm width/g/m^2 basis weight, more preferably 1.6 g/2.5 cm width/g/m^2 basis weight. If the recovery force at 50% elongation is less than 0.8 g/2.5 cm width/g/m^2 basis weight, the web exhibits insufficient recovery force for the intended application.

The nonwoven elastomeric web of the invention recovers at least 85%, preferably at least 90%, more preferably at least 95%, in the machine direction after being stretched 50% and the web preferably recovers at least 80%, more preferably at least 85%, most preferably at least 90%, in the cross direction after being stretched 50%.

The cohesive wraps of the invention can be prepared by applying a self-adhesive material such as natural rubber to the nonwoven elastomeric microfiber web of the invention. Other useful adhesives include acrylic copolymers, block copolymers, formulated rubbers, and multi-polymer blends, which are well-known in the art. The amount of self-adhesive material applied on the web is preferably in the range of 15 to 75 weight percent of the web basis weight, more preferably 25 to 40 percent of the web basis weight. The adhesive materials can be applied to the web, for example, as latexes, solutions, or powders by a variety of coating techniques such as, for example, spraying, roll coating, or padding.

Alternatively, a material which will render the surface of the melt blown fibers self-tacky can be blended with the elastomeric thermoplastic material prior to melt blowing the fiber to produce the cohesive wrap in a single step. Such materials include, for example, block copolymers, acrylic polymers, tackifying resins and natural rubber.

The adhesive wraps of the invention can be prepared by applying a pressure-sensitive adhesive material to one face of the web and a low adhesion backsize material to the opposite face of the web. A variety of pressure-sensitive adhesives can be used, but acrylate-based pressure-sensitive adhesives are preferred because of their hypoallergenicity and gas permeability and particularly preferred are acrylate-based medical pressure-sensitive adhesives because of their skin adhesion properties. The pressure-

sensitive adhesive can be applied on the nonwoven elastomeric microfiber web as a solution or a latex or, alternatively, the elastomeric web can be laminated to an adhesive film or collected directly on an adhesive film. The amount of adhesive applied on the web is preferably in the range of from 30 to 60 weight percent of the web basis weight, more preferably from 35 to 50 percent of the web basis weight.

Suitable low-adhesion backsize materials for use in the elastomeric adhesive dressings including, for example, silicone-based, urethane-based, and perfluoropolyether-based materials. Generally, urethane-based materials are preferred as the low-adhesion backsize material because they exhibit proper release characteristics and hypoallergenicity. The amount of low-adhesion backsize applied on the web is preferably in the range of 1 to 5 weight percent of the web basis weight, more preferably from 2.5 to 4 percent of the web basis weight.

The nonwoven melt blown elastomeric webs can be prepared by a process similar to that taught in Wente, Van A., "Superfine Thermoplastic Fibers" in Industrial Engineering Chemistry, Vol.48, pages 1342 et seq (1965), or in Report No. 4364 of the Naval Research Laboratories, published May 25, 1954 entitled "Manufacture of Superfine Organic Fibers" by Wente, Van A., Boone, C.D. and Fluharty, E.L. except that a drilled die is preferably used. The thermoplastic elastomeric materials are extruded through the die into a high velocity stream of heated air which draws out and attenuates the fibers prior to their solidification and collection. The fibers are collected in a random fashion, such as on a perforated screen cylinder, prior to complete fiber solidification so that the fibers are able to bond to one another and form a coherent web which does not require additional binders. In forming the adhesive dressing or the cohesive wrap of the invention, the blown fibers can be collected directly on an adhesive film carried on a release liner. Specific physical characteristics of the web are achieved by properly balancing the polymer rheology, the fiber forming and collection phases of the process to achieve desired web properties.

This invention is further illustrated by the following examples, but the particular materials and amounts thereof recited in these examples, as well as other conditions and details, should not be construed to unduly limit this invention.

In the examples all parts and percentages are by weight unless otherwise specified. The following test methods were used for evaluation purposes in the examples:

Tensile strength: ASTM Test Method No. D1682-64 using a sample width of 2.5 cm, a gauge length of 2.5 cm, and a crosshead speed of 25 cm/min;

Elongation at break: ASTM Test Method No. D1682-64 using a sample width of 2.5 cm, a gauge length of 2.5 cm, and a crosshead speed of 25 cm/min;

Force at 50% elongation: INDA Standard Test 90-75 (R77);

Recovery force at 50% elongation: INDA Standard Test 90-75 (R77); and

% Recovery: INDA Standard Test 90-75 (R77).

Cohesive strength: The non-adhesive coated side of a 2.54 cm x 2.54 cm sample of adhesive dressing is adhered to a 2.54 cm x 2.54 cm face of each of two T-shaped aluminum blocks. The adhesive coated surfaces of the samples are brought into contact with each other and a 9 kg weight is placed on the contacting mounted samples for one minute. The legs of the blocks are placed in an Instron™ tensile tester and pulled apart at a rate of 5 cm/min.

Examples 1-9

In Example 1, an elastomeric, nonwoven, melt-blown, microfiber web was prepared using thermoplastic elastomeric polyurethane polymer (PS 440-101, a polyesterurethane available from K.J. Quinn Co., Malden, MA) and a process similar to that described in Wente, Van A., "Superfine Thermoplastic Fibers" in Industrial Engineering Chemistry, Vol. 48, pages 1342 et seq (1965) or in Report No. 4364 of the Naval Research Laboratories, published May 25, 1964 entitled "Manufacture of Superfine Organic Fibers" by Wente, Van A., Boone, C.D., and Fluharty, E.L. except that the melt-blowing die had smooth surfaced orifices (10/cm) with a 5:1 length-to-diameter ratio. The die temperature was maintained at 220 °C, the primary air temperature and pressure were, respectively, 230 °C and 150 kPa, (0.63 mm gap width), and the polymer throughput rate was 450 gm/hr/cm. The resulting web had a fiber size of 5-10 µm (microns), a basis weight of 20 g/m^2, and a thickness of 0.08 mm.

In Examples 2-9, elastomeric, nonwoven, melt-blown, microfiber webs were prepared as in Example 1, except that the fiber size, basis weight and thickness of the webs was as set forth in Table I.

Table I

Example	Fiber size (μm) (microns)	Web basis weight (g/m²)	Web thickness (mm)
1	5 - 10	20	0.08
2	5 - 10	32	0.12
3	5 - 10	60	0.23
4	5 - 10	70	0.27
5	5 - 10	15	0.06
6	22 - 30	20	0.08
7	22 - 30	45	0.19
8	22 - 30	60	0.24
9	22 - 30	68	0.27

The tensile strength (TS), elongation at break (E-B), force at 50% elongation (F-50%), recovery force at 50% elongation (RF-50%), and the percent recovery (R) were determined in both the machine direction and the cross direction. The results are set forth in Tables II and III.

Table II

Machine Direction					
Example	TS (g/2.5 cm)	E-B (%)	F-50% (g/2.5 cm)	RF-50% (g/2.5 cm)	R (%)
1	820	400	160	37	95
2	1350	420	250	63	95
3	2680	440	450	120	95
4	3050	430	495	138	95
5	610	360	110	26	90
6	670	310	125	40	95
7	1600	315	310	85	95
8	2590	380	490	145	95
9	3400	400	480	160	95

Table III

Cross Direction					
Example	TS (g/2.5 cm)	E-B (%)	F-50% (g/2.5 cm)	RF-50% (g/2.5 cm)	R (%)
1	380	390	74	28	80
2	620	410	120	40	85
3	1130	440	250	75	85
4	1410	430	290	94	90
5	340	340	58	21	80
6	400	360	70	30	85
7	950	350	145	62	90
8	1430	420	270	85	90
9	1800	430	310	100	95

As can be seen from the data in Tables II and III, there are minor difference between the two fiber sizes, but the major contributor to modifying the physical properties in the web weight.

Examples 10-15

In Examples 10-15, nonwoven elastomeric small diameter fibers webs were prepared as in Example 1 except that in Examples 10 and 11 the thermoplastic elastomeric polyurethane polymer used was PS 441-400 and in Examples 12-15, the thermoplastic elastomeric polyurethane polymer was PS 455-208, both polymers available from K.J. Quinn, Malden, MA. The fiber size, web basis weight, and web thickness are set forth in Table IV.

Table IV

Example	Fiber size (µm) (microns)	Web basis weight (g/m^2)	Web thickness (mm)
10	22 - 30	63	0.24
11	22 - 30	64	0.25
12	5 - 10	19	0.08
13	5 - 10	45	0.18
14	22 - 30	49	0.20
15	22 - 30	70	0.28

The tensile strength (TS), elongation at break (E-B), force at 50% elongation (F-50%), recovery force at 50% elongation (RF-50%), and the percent recovery (R) were determined in both the machine direction and the cross direction. The results are set forth in Tables V and VI.

Table V

Machine Direction					
Example	TS (g/2.5 cm)	E-B (%)	F-50% (g/2.5 cm)	RF-50% (g/2.5 cm)	R (%)
10	2540	390	490	130	90
11	2470	400	490	135	90
12	730	430	135	30	95
13	1970	410	330	82	95
14	2410	420	390	105	95
15	3400	410	460	125	95

Table VI

Cross Direction					
Example	TS (g/2.5 cm)	E-B (%)	F-50% (g/2.5 cm)	RF-50% (g/2.5 cm)	R (%)
10	1160	490			
11	1070	480			
12	380	450	65	23	90
13	970	450	135	58	90
14	1210	460	205	68	90
15	1700	460	270	95	90

As can be seen from the data in Tables V and VI, resins with different properties are processable into webs which have suitable properties and characteristics and may be more desirable for specific end use requirements.

Comparative Examples 16A and 17A

In Comparative Examples 16A and 17A, nonwoven elastomeric microfiber webs were made as in Example 1 except that the thermoplastic elastomeric polyurethane polymer used was PS 455-208 and the polyurethane was blended with a hot melt acrylate-based cohesive resin, a copolymer at 95 weight percent isooctyl acrylate and 5 weight percent acrylic acid. In Comparative Example 16A, 70 parts polyurethane were blended with 30 parts of the acrylate-based cohesive resin and, in Comparative Example 17A, 50 parts polyurethane were blended with 50 parts of the acrylate-based cohesive resin. The fiber size, web basis weight, and web thickness are set forth in Table VII.

Table VII

Comparative Example	Fiber size (microns)	Web basis weight (g/m^2)	Web thickness (mm)
16A	22 - 30	45	0.20
17A	22 - 30	48	0.21

The tensile strength (TS), elongation at break (E-B), force at 50% elongation (F-50%), recovery force at 50% elongation (RF-50%), and the percent recovery (R) were determined in both the machine direction and the cross direction. The results are set forth in Tables VIII and IX. The cohesive strength of the webs was also determined.

Table VIII

Machine Direction					
Example	TS (g/2.5 cm)	E-B (%)	F-50% (g/2.5 cm)	RF-50% (g/2.5 cm)	R (%)
16A	1300	270	390	78	80
17A	1100	225	370	72	70

Table IX

		Cross Direction			
Example	TS (g/2.5 cm)	E-B (%)	F-50% (g/2.5 cm)	RF-50% (g/2.5 cm)	R (%)
16A	580	240			
17A	520	240			

The cohesive strength of the cohesive wraps of Comparative Examples 16A and 17A was about 200 g/2.5 cm and therefore independent of web construction.

Examples 18-31

In Example 18, an elastomeric cohesive wrap was prepared by coating one face of the nonwoven elastomeric microfiber web of Example 1 with a natural rubber-based latex cohesive material, GNL 200, 55 % solids latex, available from Goodyear Rubber Co., at a coating weight of 18 g/m^2 using a knurled roll coater apparatus. After coating, the web was dried in a circulating air oven at 110 °C for about 3 minutes.

In Examples 19-23, elastomeric cohesive wraps were prepared as in Example 18 except the nonwoven microfiber webs used and the coating weight of the cohesive material were as set forth in Table X.

Each coated web was tested for cohesive strength. The results are set forth in Table X.

Table X

Example	Web (Example)	Coating weight (g/m^2)	Cohesive strength (g/2.5 cm)
18	1	18	WF*
19	6	20	WF
20	7	32	WF
21	10	16	WF
22	11	30	WF
23	12	34	WF

* Web failure

As can be seen from the data in Table X, the cohesive strength exceeds the web strengths at these coating weights.

Examples 24-31

In Example 24, an elastomeric cohesive wrap was prepared by coating both faces of the nonwoven elastomeric microfiber web of Example 1 with a natural rubber-based latex cohesive material, GNL 200, 55 % solids latex, available from Goodyear Rubber Co., at a coating weight of 6 g/m^2 using a spray coater apparatus. After coating, the web was dried in a circulating air oven at 110° C for about 1.5 minutes.

In Examples 25-30, elastomeric cohesive wraps were prepared as in Example 24, except the nonwoven microfiber webs used and the coating weight of the cohesive material were as set forth in Table XI.

In Example 31, an elastomeric cohesive wrap was prepared as in Example 24, except the cohesive material wasa styrene-butadiene-based material, Tylac™ 97-698 available from Reichold Chemicals, Inc., Dover, DE, and the nonwoven microfiber web of Example 10 was used.

Each coated web was tested for cohesive strength. The results are set forth in Table XI.

Table XI

Example	Web (Example)	Coating weight (g/m^2)	Cohesive strength (g/2.5 cm)
24	1	6	370
25	7	8	360
26	7	10	460
27	10	5	300
28	10	8	370
29	11	9	390
30	11	13	520
31	10	6	190

As can be seen from the data in Table XI, suitable cohesive wrap can be made using various webs, adhesives, and adhesive coating weights.

Examples 32-36

In Example 32, an elastomeric adhesive dressing was prepared by coating one face of the elastomeric microfiber web of Example 12 with a 5 weight percent solution of polyvinyl carbamate and drying the coated web at 120° C for 1.5 minutes to provide a low adhesion backsize (2 g/m^2) on the web and then coating a 22 weight percent solution of a copolymer of 97 parts isooctyl acrylate and 3 parts acrylamide onto a release liner (2060 BKG 157-168A, available from Daubert Coated Products, Dixon, IL) drying the coated adhesive in a circulating air oven at 40°C for 1.0 minutes to obtain a semi-wet adhesive as taught in U.S. Patent No. 3,121,021 (Copeland), laminating this adhesive onto the face of the web not bearing the low adhesion backsize coating, and then drying the laminate at 120°C for 3 minutes.

In Examples 33 and 34, elastomeric adhesive dressings were prepared as in Example 32 except no low adhesion backsize coating was used and the web used was as set forth in Table XII.

In Examples 35 and 36, elastomeric adhesive dressings were prepared as in Example 32 except the adhesive was dried at 120°C for 3 minutes to provide a dry adhesive which was applied to the elastomeric microfiber web as set forth in Table XII.

Each adhesive dressing was tested for adhesion to steel and to the low adhesion backsize coating using ASTM Test Method D-1000. The results are set forth in Table XII.

Table XII

Example	Web (Example)	Coating weight (g/m^2)	Adhesion steel (g/2.5 cm)	Adhesion backing (g/2.5 cm)
32	12	26	135	15
33	3	26	255[a]	WF[b]
34	4	26	270[a]	WF
35	12	25	254	26
36	13	25	251	23

[a] adhesive transfer
[b] web failure

As can be seen from the data in Table XII, elastic pressure-sensitive adhesive tapes can be prepared using the nonwoven elastomeric webs of the invention. As shown by the dressings of Examples 33 and 34, which do not have a low adhesion backsize coating, the low adhesion backsize coating is an integral part of the dressing where the dressing material is to be provided wound in a roll or supplied as a layered pack.

Examples 37-40

In Example 37, an elastomeric adhesive dressing was prepared by applying a low adhesion backsize coating on one face of the elastomeric microfiber web of Example 11 as in Example 32 and spray coating an adhesive solution containing 40 weight percent of a copolymer of 90 parts isooctyl acrylate and 10 parts acrylic acid onto the other face and drying the adhesive coated web at 105°C for 3 minutes to provide an adhesive coating weight of 5 g/m^2.

In Example 38, an elastomeric adhesive dressing was prepared as in Example 37 except the adhesive coating was applied to achieve an adhesive coating weight of 8 g/m^2.

In Examples 39 and 40, elastomeric adhesive dressings were prepared as in Example 37 except in Example 39 the adhesive was a formulated block copolymer of 45 parts Kraton™ 1107, available from Shell Chemical Co. and 55 parts Wingtack™ resin, available from Goodyear Co., rapidly dissolved in toluene at 20 weight percent solids and in Example 40 the adhesive was 36-6053, a natural rubber adhesive available from National Adhesives Co.

Each adhesive dressing was tested for adhesion to steel and to the low adhesion backsize coating using ASTM Test Method D-1000. The results are set forth in Table XIII.

Table XIII

Example	Web (Example)	Coating weight (g/m^2)	Adhesion steel (g/2.5 cm)	Adhesion backing (g/2.5 cm)
37	11	5	35	*
38	11	8	42	*
39	11	8	24	*
40	11	8	16	*

* too low to obtain value

As can be seen from the data in Table XIII, pressure-sensitive adhesive dressings can be prepared using an adhesive spray process and that various types of adhesive are suitable for preparing the

elastomeric adhesive dressings of the invention.

Comparative Examples 1-6

In Comparative Examples 1 and 2, polyurethane spunbond elastic webs commercially available under the tradename "Bondina" were tested for tensile strength and elongation at break in both the machine diection and in the cross direction.

In Comparative Examples 3 and 4, polyurethane spunbonded webs commercially available under the tradenames "Kanebo EA-50" and "Kanebo EA-75" were tested for tensile strength and elongation at break in both the machine direction and the cross direction.

In Comparative Examples 5, a melt blown microfiber web was prepared using Kraton™ G, an elastomeric styrenic-ethylene-butylene block copolymer available from Shell Chemical Company, Houston, TX, as disclosed in U.S. Patent No. 4,692,371 (Morman et al.) and tested for tensile strength and elongation at break in both the machine direction and the cross direction.

In Comparative Example 6, a melt blown microfiber web was prepared using a blend of 80 weight percent Kraton™ G and 20 weight percent polyethylene wax (PE Na601, available from U.S.I. Chemical Company) as disclosed in U.S. Patent No. 4,663,220 (Wisneski et al.) and tested for tensile strength and elongation at break in both the machine direction and the cross direction.

The basis weight and fiber size for each web is set forth in Table XIV. The tensile strength and elongation at break for each comparative example are set forth in Table XV.

Table XIV

Comparative Example	Basis weight (g/m^2)	Fiber size (microns)
1	35	80 +
2	62	80 +
3	49	35 - 55
4	76	40 - 55
5	110	20 - 30
6	105	20 - 30

Table XV

Comparative Example	Machine direction		Cross direction	
	Tensile strength (g/2.5 cm)	Elongation at break (%)	Tensile strength (g/2.5 cm)	Elongation at break (%)
1	625	310	185	360
2	1050	270	290	350
3	1500	380	450	400
4	2300	380	740	410
5	1200	850	420	950
6	675	750	200	900

As can be seen from the data in Table XV, the tensile strength in the machine direction is greater than 2-1/2 times the tensile strength in the cross-direction in each example.

The various modifications and alterations of this invention will be apparent to those skilled in the art without departing from the scope of this invention and this invention should not be restricted to that set forth herein for illustrative purposes.

Claims

1. A nonwoven elastomeric web comprising thermoplastic elastomeric melt blown small diameter fibers having a diameter of less than 50 µm (microns), characterized in that the small diameter fibres are randomly arrayed and bonded at points of contact, the tensile strength of the web in the direction of web formation, is no greater than 2.5 times the tensile strength of the web in a direction perpendicular to the direction of web formation, the web has a machine direction tensile strength of at least 30 g/2.5 cm width/g/m^2 basis weight, and the web recovers at least 85% in the machine direction after being stretched 50%.

2. The nonwoven elastomeric web of claim 1 wherein said thermoplastic elastomeric small diameter fibers comprise elastomeric polyurethanes, elastomeric polyesters, elastomeric polyamides and elastomeric A-B-A' block copolymers wherein A and A' are styrenic moieties and B is an elastomeric midblock.

3. The nonwoven elastomeric web of any preceding claim wherein the elastomeric small diameter fibers have diameters of from 5µm (microns) to 30µm (microns).

4. The nonwoven elastomeric web of any preceding claim wherein the basis weight of the nonwoven elastomeric web is in the range of from 15 to 150 grams/m^2.

5. The nonwoven elastomeric web of any preceding claim wherein the web has an elongation at break of at least 250%.

6. The nonwoven elastomeric web of any preceding claim wherein the web has a machine direction force at 50% elongation of at least 5 g/2.5 cm width/g/m^2 basis weight.

7. The nonwoven elastomeric web of any preceding claim wherein the web has a recovery force at 50% elongation of at least 1.2 g/2.5 cm width/g/m^2 basis weight.

8. The nonwoven elastomeric web of any preceding claim wherein the web recovers at least 80% in the cross direction after being stretched 50%.

9. An adhesive dressing comprising (1) the nonwoven elastomeric web of any preceding claim having a first face, (2) a pressure-sensitive adhesive on the first face of the web, and (3) a low adhesion back size coating on the second face of the web.

10. An elastomeric cohesive wrap comprising (1) the nonwoven elastomeric web of any preceding claim having a first face,(2) a self-adhesive coating adhered to at least one face of the web such that one portion of the web can adhere to another portion of the web.

Patentansprüche

1. Elastomere Faservliesbahn umfassend thermoplastische elastomere schmelzgeblasene Fasern mit einem kleinen Durchmesser von weniger als 50 µm (Mikrometer), dadurch gekennzeichnet, daß die Fasern mit kleinem Durchmesser wirr angeordnet sind und an Kontaktstellen zusammengeklebt sind, daß die Zugfestigkeit der Bahn in Richtung der Vlieslegung nicht mehr als das 2,5fache der Zugfestigkeit der Bahn in einer Richtung senkrecht zur Richtung der Vlieslegung beträgt, daß die Bahn in Faserrichtung eine Zugfestigkeit von mindestens 30 g/2,5 cm Breite/g/m^2 Flächengewicht besitzt, und daß die Bahn sich in Faserrichtung um mindestens 85% erholt, nachdem sie um 50% gestreckt wurde.

2. Elastomere Faservliesbahn nach Anspruch 1, dadurch gekennzeichnet,daß die thermoplastischen elastomeren Fasern mit kleinem Durchmesser elastomere Polyurethane, elastomere Polyester, elastomere Polyamide und elastomere A-B-A'-Blockcopolymere umfassen, wobei A und A' Styrolgruppen sind und B ein elastomerer Mittelblock ist.

3. Elastomere Faservliesbahn nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die elastomeren Fasern mit kleinem Durchmesser einen Durchmesser im Bereich von 5 µm (Mikrometer) bis 30 µm (Mikrometer) besitzen.

4. Elastomere Faservliesbahn nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Flächengewicht der elastomeren Faservliesbahn im Bereich von 15 bis 150 g/m^2 liegt.

5. Elastomere Faservliesbahn nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Bahn eine Reißdehnung von mindestens 250% besitzt.

6. Elastomere Faservliesbahn nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Bahn bei einer Dehnung von 50% eine Kraft in Faserrichtung von mindestens 5 g/2,5 cm Breite/g/m^2 Flächengewicht besitzt.

7. Elastomere Faservliesbahn nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Bahn bei einer Dehnung von 50% eine Erholungskraft von mindestens 1,2 g/2,5 cm Breite/g/m^2 Flächengewicht besitzt.

8. Elastomere Faservliesbahn nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Bahn sich um mindestens 80% in Querrichtung erholt, nachdem sie um 50% gestreckt wurde.

9. Klebeverband umfassend (1) die elastomere Faservliesbahn nach einem der vorhergehenden Ansprüche mit einer ersten Seite, (2) einen Haftkleber auf der ersten Seite der Bahn, und (3) eine schwach haftende Rückenappretur auf der zweiten Seite der Bahn.

10. Elastomerer haftender Wickel, umfassend (1) die elastomere Faservliesbahn nach einem der vorhergehenden Ansprüche mit einer ersten Seite, (2) einen selbstklebenden Überzug, der auf mindestens eine Seite der Bahn aufgebracht ist,so daß ein Abschnitt der Bahn auf einem anderen Abschnitt der Bahn haften kann.

Revendications

1. Bande élastomérique non tissée comprenant des fibres élastomériques thermoplastiques de fondu-soufflé de faible diamètre, ayant un diamètre de moins de 50 µm (microns), caractérisée en ce que, les fibres de faible diamètre sont disposées au hasard et reliées en des points de contact, la résistance à la rupture par traction de la bande selon la direction de la formation de la bande est au plus 2,5 fois la résistance à la rupture par traction de la bande selon une direction perpendiculaire à la direction de la formation de la bande, la bande possède une résistance à la rupture selon la direction machine d'au moins 30 g/2,5 cm de largeur/g/m^2 de poids de base, et la bande récupère au moins 85% selon la direction machine après avoir été étirée de 50%.

2. Bande élastomérique non tissée de la revendication 1, dans laquelle lesdites fibres élastomériques thermoplastiques de faible diamètre comprennent des polyuréthanes élastomériques, des polyesters élastomériques, des polyamides élastomériques et des copolymères séquencés élastomériques A-B-A' dans lesquels A et A' sont des fractions styréniques et B est une séquence centrale élastomérique.

3. Bande élastomérique non tissée selon l'une quelconque des revendications précédentes, dans laquelle les fibres élastomériques de faible diamètre ont des diamètres allant de 5 µm (microns) à 30 µm (microns).

4. Bande élastomérique non tissée selon l'une quelconque des revendications précédentes, dans laquelle le poids de base de la bande élastomérique non tissée est situé dans l'intervalle de 15 à 150 g/m^2.

5. Bande élastomérique non tissée selon l'une quelconque des revendications précédentes, dans laquelle la bande possède un allongement à la rupture d'au moins 250%.

6. Bande élastomérique non tissée selon l'une quelconque des revendications précédentes, dans laquelle la bande possède une force selon la direction machine à 50% d'allongement d'au moins 5 g/2,5 cm de largeur/g/m^2 de poids de base.

7. Bande élastomérique non tissée selon l'une quelconque des revendications précédentes, dans laquelle la bande possède une force de récupération à 50% d'allongement d'au moins 1,2 g/2,5 cm de

largeur/g/m^2 de poids de base.

8. Bande élastomérique non tissée selon l'une quelconque des revendications précédentes, dans laquelle la bande récupère au moins 80% selon la direction transversale après avoir été étirée de 50%.

9. Pansement adhésif comprenant (1) une bande élastomérique non tissée selon l'une quelconque des revendications précédentes ayant une première face, (2) un adhésif sensible à la pression sur la première face de la bande, et (3) un revêtement d'encollage arrière de faible adhérence sur la deuxième face de la bande.

10. Enroulement élastomérique cohésif comprenant (1) une bande élastomérique non tissée de l'une quelconque des revendications précédentes ayant une première face, (2) un revêtement auto-adhésif adhérant à au moins une face de la bande, de telle sorte qu'une partie de la bande puisse adhérer à une autre partie de la bande.